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1.9 The distance within which these rivers descend to the sea level being very short, there are generally a large number of steep falls or a series of cascades in their courses. These provide a rich potential for generation of hydro-electric power, which can be generated at a low cost (1.7 nP per kWh on an average). This low cost power potential is an important asset of Kerala from the point of view of the future programmes of industrialization.

1.10 Some other implications of topographical features are not so obvious. For example, the lakes, the lagoons and the backwaters fringed with coconut palms, no doubt, impart to Kerala its characteristic scenic beauty and provide one of the chief tourist attractions. Their importance, however, goes much beyond the purely aesthetic aspect. In fact, the backwaters—especially in the Travancore-Cochin region—are indirectly responsible for providing the means of livelihood to a vast section of the population. Coir spinning, the chief industry of Kerala, is located in this State primarily because of the natural retting facilities provided by the backwaters. The availability of these facilities is unique in the case of Kerala. In almost all other coconut-growing areas of India, the coconut husks go waste because of the absence of natural retting facilities. Since coir industry provides an occupation to 4 to 5 lakh persons (about 10% of the total working force and 40% of industrial working force), one can well imagine what the unemployment situation in Kerala would have been in the absence of the backwater facilities. The backwaters have also facilitated the development of a wide network of inland waterways all along the coastline. Apart from employing a large number of persons in towing or rowing the boats, the inland waterways provide inexpensive modes of transporting the agricultural produce and light industrial goods manufactured in the coastal area.

1.11 Up till now only some of the favourable consequences of physical features have been pointed out. The sloping terrain and preponderance of backwaters in the coastal area also possess a negative aspect. The heavy downpour is gradually leaching off the mineral content of the soils, thus rendering them generally poor in their fertility status. One of its ultimate consequences is the fact that livestock feed available in Kerala is deficient in mineral content and this in turn reduces the yield of milk of the livestock. The heavy precipitation of rain also creates a serious flood control problem in Kerala.

1.12 The backwaters raise other problems as well. During the dry summer months saline water from these flows into the lower reaches of the rivers, many of which fall into the backwaters. This has an adverse effect on cultivation and the supply of drinking water in the coastal areas. Coastal areas are, therefore, beset with the problem of salinity control. The chain of consequences does not stop here. Recently implementation of one of the important salinity control measures in Kerala, viz., the Thanneermukkom bund across the Vembanad lake has created a new problem in its wake. The accretion of limeshell deposits, an important raw material found in the lake, depends on the high salinity of the lake water. Since, after putting up of the barrage salinity of water will get reduced, it will have adverse repercussions on the long run supply position of the limeshells. This, in turn, jeopardizes the long run prospects of the cement industry in the State which is based on the limeshells.

[text continues on p. 6]

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of the rivers. The best known among these is that of Vembanad lake; other less important occurrences are in the estuaries of the Kadalundi and Korapuzha rivers, Kozhikode district and Cranganore lake. Only a few of these tracts have been prospected so far. A systematic exploration programme should, therefore, be initiated in all the backwater and estuarine tracts.

6.46 The deposits in Vembanad lake were surveyed by the Travancore Cement Company in 1946. There was no layer of limeshell as such, but it occurred amidst sands and clays, the total thickness of the mixed deposits varying from 1-7 feet. Reserves as estimated then were 3 million tons.

6.47 In addition, in the estuary of the Kadalundi river 400,000 to 500,000 tons of limeshell are estimated to be available in an area of 300 acres.[1] About 100,000 tons of material is also likely to be available from the lower reaches of the rivers Pullut and Thathapally which drain into the Cranganore lake.[2]

6.48 These limeshell deposits provide a raw material of very high purity and which is eminently suitable for use in the chemical industry and in the manufacture of white cement.

6.49 The present production is mainly from Kottayam and Alleppey districts, where the Vembanad lake deposits are exploited. Small quantities are also won from the Kadalundi and Korapuzha estuaries. Details of production available for 1959 are given below:

District	*Quantity* (Metric tons)	*Value* (Rs.)
Alleppey	9,098	76,542
Kottayam	86,309	696,333
Kozhikode	500 to 1,000	N.A.

6.50 Excepting small quantities sent to the adjoining States from Kozhikode district, the State's output is consumed within the State. The cement company consumes 70,000 tons of shells a year for producing 50,000 to 60,000 tons of grey cement. About 26,000 tons a year are used in lime-burning of which 25,000 tons come from the Vembanad lake.

6.51 Other limeshell utilizing industries which are under active consideration are a sand-lime brick factory at Pallathara with a capacity of 44,000 bricks a day and a calcium carbide factory at Chingavanam with a capacity of 10,000 tons a year. Both these would use shells from Vembanad lake and their annual requirements would be 8,500 tons and 10,000 tons respectively.

6.52 The total annual requirement during 1961–66 would thus be 108,500 tons of shells from the Vembanad lake. In view of the fact that the cement factory has been in existence for the last 11 years and has already consumed about a third of the original reserve of 3 million tons, proposals for new limeshell-based industries in the same area introduce problems regarding assured reserves of raw materials and their conservation.

[1] *Administration Report of the Geological Department*, Government of Kerala, 1958-59, pp. 3-4.
[2] Ibid pp. 3-4.

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6.53 First, possibilities of an alternative source, e.g., shells from the sea, should be assessed quantitatively, which could possibly meet requirements of the local lime-burning units. This would relieve the pressure on the lake and estuarine deposits, which could then be conserved for larger industrial units.

6.54 Secondly, new industries could perhaps be located near other known shell deposits. A case in point here is the Calcium Carbide Factory requiring about 10,000 tons annually, which could be located in the Kadalundi area where reserves of the order of 400,000 to 500,000 tons are available. In this location the unit would be assured of its shell requirements for the next 40 to 50 years on the basis of an average annual requirement of 10,000 tons, whereas in the Vembanad lake location, reserves would last only for 15 to 20 years.

6.55 The requirements of the sand-lime brick factory, however, are only about 3,500 tons a year and it should be possible to accommodate this requirement from the present consumption of 25,000 tons by the lime-burning industry.

6.66 In this context, it would be relevant to mention that in absolute terms, the accretion of shells is rather small; and in terms of the proposed rate of exploitation this accretion is even negligible. Further, the proposal to construct a bar across the mouth of the Vembanad lake would change the salinity of the water and would very likely put an end even to this small accretion. As to whether the shell organism could be simulated to thrive on a large scale is a problem for long term research.

6.57 In the meantime, in view of the rapid depletion of reserves in the Vembanad lake, strict control should be exercised over the exploitation of this deposit with periodical inspection to check unauthorized collection. The rate of exploitation may be kept at the present level but should not be allowed to rise.

Mica

6.58 Two varieties of mica, muscovite and phlogopite are known to occur in the State. Muscovite is reported from Kulikhoor, and Sholayaramson from Palghat district and phlogopite from Punalur in Quilon district. However data relating to reserves are not available for any of these deposits.

6.59 At Kulikoor in Palghat district, a few prospecting pits have been put down which exposed a small vein of ruby mica with very little strains. The presence of ruby mica on a fairly large scale along the same belt in the adjoining State may be taken as a favourable indication. Further prospecting should be undertaken in the area.

6.60 Production from the only mine in the State at Punalur has been intermittent. Figures for production since 1957 when mining activity was revived are given below:

Year	*Quantity* (Metric tons)	*Value* (Rs.)
1957	72	40,000
1958	72	40,000
1959	46	23,000

6.67 In the erstwhile State of Travancore-Cochin, there were 14 centres of production around Cape Comorin and one at Malipuram, Vyppeen Island, Ernakulam district. Consequent upon reorganization of the States, there is only one salt work in Kerala today. This is reflected in the sudden drop in production to a few hundred tons of salt between 1955 and 1956.

6.68 The prime requisite for the manufacture of salt by the solar evaporation method is a dry climate with accompanying low humidity. Such a condition is rarely obtained anywhere in the State. The result is that the yield of salt is very low with the cost of production at 75 nP. to a rupee per maund (in Tuticorin—cost of production is 25 nP.). In view of the unfavourable climatic conditions, this industry does not appear to have much prospects in the State.

Tile-Clay

6.69 Tile-clay is the raw material for one of the major industries of Kerala viz., the tile industry. More than 150 tile factories operate in the State, providing employment to over 10,000 workers. Tiles produced are sent to other parts of India as well as to markets in some of the Far Eastern countries. The exports are mainly from the Feroke area.

6.70 Local earths, silts and clays are found along the alluvial flats of most of the rivers of the State. Clay collection is seasonal and is undertaken through contractors. It provides employment to about 3,500 people. Collection is done manually and the clay is transported by country crafts along the waterways, or by roads, where water transport facilities are not available. Depending on the distance of transportation, the price of clay varies from Rs. 2 to Rs. 5 per ton at the factory.

6.71 In 1865, the 'Basel German Industrialists' started the first tile factory in the country at Mangalore with the object of securing the Far East Market, which was until then being supplied by the French tile industry in Marseilles. The industry then spread rapidly, first to Feroke near Kozhikode and later on to Quilon and other areas, until today, Kerala can well claim to be the home of the tile industry in the country.

6.72 Production of tile-clay in the State during the last few years is given in Table 31.[1]

6.73 As can be observed, there has been a declining trend in tile production. The main part of the decrease has taken place in the major tile producing areas of Trichur and Quilon,

6.74 The decline in output of tiles is due to a shrinkage in the foreign markets. On the other hand, an optimum area for distribution within the internal market is a belt of 400 miles from the coast. In view of the near saturation point which Kerala's tile industry has reached, prospects for increased production of tile-clay are rather bleak.

Other Minerals

6.75 *Gold* : Occurrences of gold in Wynaad and Nilambur area have been known since the late nineteenth century. The discovery of old workings led to the

[1] [Table 31, appearing on p. 291 of the text, has not been processed -- Analyst]